

### **REMARKS**

Claims 1-85 are pending in the application. Claims 2, 17 and 29-85 are withdrawn from consideration.

#### **Rejection of Claims 1, 3-16, 18, 19 and 22-28 under 35 U.S.C. §103(a)**

Claims 1, 3-16, 18, 19 and 22-28 are rejected under 35 U.S.C. §103(a) as being unpatentable over O'Hagan et al., WO 98/33487 (O'Hagan) in view of Hawkins et al., US 6,290,973 (Hawkins). This rejection and its supporting remarks are respectfully traversed.

As noted in the response to the prior Office Action, a proper rejection under 35 U.S.C. 103 requires, *inter alia*, an explanation as to why one of ordinary skill in the art at the time the invention was made would have been motivated to make a proposed modification to the prior art to arrive at the claimed subject matter. See MPEP 706.02(j). See also Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727, (2007):

The Supreme Court in *KSR* noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Court quoting *In re Kahn* ... stated that “ ‘[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.’ ”

The Examiner has asserted that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of O'Hagan with Hawkins to make an immunogenic composition comprising water, polymer microparticle, antigen adsorbed to microparticle, and various synthetic phospholipids “for the purpose of immunizing a subject to increase or enhance immunogenic activity, immune response or stimulate/enhance protection against an infectious antigen for example.”

Applicant had previously noted that, rather than providing “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness” as required by *KSR*, the Examiner has instead taken multiple references disclosing various elements of the claimed invention and combined them together as an obviousness rejection.

The Examiner has responded to the preceding argument by quoting the following from MPEP 2144.06:

"It is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used

for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted) (Claims to a process of preparing a spray-dried detergent by mixing together two conventional spray-dried detergents were held to be *prima facie* obvious.). See also *In re Crockett*, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) (Claims directed to a method and material for treating cast iron using a mixture comprising calcium carbide and magnesium oxide were held unpatentable over prior art disclosures that the aforementioned components individually promote the formation of a nodular structure in cast iron.); and *Ex parte Quadranti*, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992) (mixture of two known herbicides held *prima facie* obvious).

The present application, however, does not constitute a case in which the *Kerkhoven* rationale can be relied on in support of a legal conclusion of obviousness. For example, *Kerkhoven* involved "two compositions each of which is taught by the prior art to be useful for the same purpose". Moreover, the claims required "no more than the mixing together of two conventional spray-dried detergents." 626 F.2d at 850.

That is not the case here. As indicated by the Examiner, the polymer microparticle and synthetic phospholipid compound of the invention are adjuvants. However, O'Hagan and Hawkins do not teach or suggest that particulate adjuvants and synthetic phospholipid adjuvants are in any way interchangeable/useful for the same purpose.

For example, O'Hagan teaches at page 2 that "[p]articulate carriers with adsorbed or entrapped antigens have been used in an attempt to elicit adequate immune responses. Such carriers present multiple copies of a selected antigen to the immune system and promote trapping and retention of antigens in local lymph nodes. The particles can be phagocytosed by macrophages and can enhance antigen presentation through cytokine release." There is no teaching or suggestion in Hawkins, on the other hand, that synthetic phospholipids such as those presently claimed could be used as carriers for adsorbed or entrapped antigens. Thus, O'Hagan and Hawkins clearly do not teach "two compositions ... useful for the same purpose" and *Kerkhoven* is not on point.

Apparently referring to MPEP 2141 (and *KSR*), pages 7-8 of the Office Action further state the following (emphasis added):

The Supreme Court further stated that: When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a *predictable* variation, §103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that

it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *Id.* at \_\_\_, 82 USPQ2d at 1396. When considering obviousness of a combination of known elements, the operative question is thus “whether the improvement is more than the *predictable* use of prior art elements according to their established functions.” *Id.* at \_\_\_, 82 USPQ2d at 1396.

Unlike *KSR*, which pertained to a predictable technology (i.e., automotive pedals), the present invention pertains to the chemical arts (and more particularly, the biochemical arts), which are highly unpredictable. (Such unpredictability is evidenced by the Edelman and Spickler references, discussed below.)

Indeed, the Federal Circuit, post *KSR*, has indicated that the obviousness bar is high for chemical inventions: “[t]o the extent an art is unpredictable, as chemical arts often are, *KSR*’s focus on... ‘identified, predictable solutions’ may present a difficult hurdle because potential solutions are less likely to be genuinely predictable.” *Eisai Co. Ltd. v. Dr. Reddy’s Laboratories, Ltd.*, 533 F.3d 1353, 1359 (Fed. Cir. 2008).

See also, *Ortho-McNeil Pharmaceutical Inc. v. Mylan Laboratories Inc.*, 520 F.3d 1358 (Fed. Cir. 2008), in which the Court affirmed the district court’s denial of Mylan’s motion for summary judgment of invalidity under § 103. The Court found that the ordinarily skilled artisan would have to have some reason to select among several unpredictable alternatives, which supported the conclusion that “this clearly is not the easily traversed, small and finite number of alternatives that *KSR* suggested might support an inference of obviousness.” *Id.* at 1364.

It is further noted that a reasonable expectation of success is required to support a conclusion of obviousness. See MPEP 2143.02 and the cases cited therein, including *KSR*. Where immunological adjuvants are concerned, however, one of ordinary skill in the art would not have a reasonable expectation of success. In support of this fact, Applicant had previously presented R. Edelman, *Molecular Biotechnology*, 21(2) 2002, 129-148 (Edelman), which demonstrated that those of ordinary skill in the art would have recognized that (a) every adjuvant (including microparticle adjuvants) has a complex and often multi-factorial immunological mechanism, usually poorly understood in vivo, (b) many determinants of adjuvanticity exist and (c) each adjuvanted vaccine is unique. Accordingly, the choice of an adjuvant frequently depends upon experimental trial and error. *Id.*

In an attempt to dismiss Edelman, the Examiner argues in the Office Action that Edelman “is not a part of the 103 obviousness rejection.” Although this is true, it is also beside the point.

Edelman was cited by Applicant to show that the art of the present invention is unpredictable and thus there is no reasonable expectation of success. See MPEP 2143.02.II. (“AT LEAST SOME DEGREE OF PREDICTABILITY IS REQUIRED; APPLICANTS MAY PRESENT EVIDENCE SHOWING THERE WAS NO REASONABLE EXPECTATION OF SUCCESS”).

Expectations of success are even further diminished by the fact that the present invention is directed to a *combination* of adjuvants (i.e., a polymer microparticle and a synthetic phospholipid). In this regard, see, page 278 of the attached article, A.R. Spickler et al., *J Vet Intern Med* 2003;17: 273-281 (Spickler), wherein under the heading “Combined Adjuvants,” the following is stated: “The result of combining adjuvants depends on the mechanism of action and toxicity of each individual component. Combinations may be better, similar to, or worse than the individual components.”

In view of the foregoing, it is respectfully submitted that, without undue hindsight gained upon review of the present specification and claims, the presently pending claims are unobvious in view of the teachings of O’Hagan and Hawkins. See, e.g., MPEP 2142, second paragraph, *Akzo N.V. v. U.S. International Trade Commission*, 808 F.2d 1241, 1480-81, 1 U.S.P.Q.2d, 1241, 1246 (Fed. Cir. 1986), *cert. denied*, 482 U.S. 909 (1987), and *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 874, 228 U.S.P.Q. 90-99 (Fed. Cir. 1985).

Consequently, a *prima facie* case of obviousness has not been established by the Examiner. For at least these reasons, reconsideration and withdrawal of the Examiner’s rejection are requested.

#### **Rejection of Claims 20 and 21 under 35 U.S.C. §103(a)**

Claims 20 and 21 are rejected under 35 U.S.C. §103(a) as being unpatentable over O’Hagan and Hawkins in view of Muttillainen et al., *Microbial Pathogenesis*, 1995, 18:423-436 (Muttillainen) and Cox et al., *Vaccine*, 1997, 15/3:248-256 (Cox). This rejection and its supporting remarks are respectfully traversed.

Specifically, it is alleged in the Office Action that it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of O’Hagan, Hawkins, Muttillainen and Cox with a reasonable expectation of success to prepare the immunogenic compositions as claimed.

In support of the foregoing conclusion, the Office Action urges that O'Hagan and Hawkins teach the claimed invention except for the specific antigen, *Neisseria meningitidis* (claim 21) and meningitis B (claim 20). Various deficiencies in O'Hagan and Hawkins, however, are discussed above (including the lack of articulated reasoning with some rational underpinning to support a conclusion of obviousness, lack of predictability, and lack of a reasonable expectation of success).

The Examiner further cites Mutilainen as teaching a composition comprising meningitis serogroup B P1 antigen in phospholipid vesicles or liposomes and that the liposome formulation is good as an adjuvant.

With regard to Cox, the Examiner points to the following statement at page 253: "The purpose of adjuvant combinations is to combine various adjuvant components to achieve the desired mix of immunological responses". This statement, however, is vague, effectively amounting to wishful thinking that is not supported by adjuvant science at the time of the invention.

For example, as indicated above, adjuvant selection and combination is a complex and poorly understood undertaking, with successful outcomes generally being the rare result of a long, unpredictable, empirical, trial-and-error-based endeavor. See e.g., the Abstract of Edelman ("choice of an adjuvant often depends upon expensive experimental trial and error"). See further page 278 of Spickler, wherein under the heading "Combined Adjuvants," the following is stated: "Combinations may be better, similar to, or worse than the individual components."

It should also be noted that the discussion of adjuvant combinations on page 253 of Cox pertain generally to three types of adjuvant combinations, specifically, w/o formulations, o/w emulsions and liposome formulations, which are nothing like the solid microparticle-based adjuvant combination presently claimed. In this regard, to the extent that Cox discusses microparticles as adjuvants, there is a clear bias against the same: "Preparation is difficult, and certain issues related to manufacture and control remain to be resolved." See Cox, page 251.

Furthermore, in various instances, a combination of adjuvants is not dictated. One example of this is the *N. meningitidis* serogroup B vaccine from Novartis Vaccine and Diagnostics Inc., which is comprised five proteins with an alum adjuvant. Thus, contrary to the Examiner's assertion that one of ordinary skill in the art would be motivated to combine multiple

adjuvants together, this real world example demonstrates that there is no problem to be solved at all, because alum is by itself sufficient.

Citing *KSR*, the Examiner additionally urges that “it would be obvious to apply a known technique to a known product to be used in a known method that is ready for improvement to yield *predictable* results.” (Emphasis added.)

The Examiner’s reliance on *KSR* is unfounded as the invention at issue in *KSR* was in a very predictable art and there was a known problem that was being solved. *KSR* involved addressing a known problem with “a finite number of identified, predictable solutions” *KSR*, 127 S. Ct. at 1742.

As pointed out above, adjuvant science is anything but predictable. Indeed, when it comes to adjuvants, there are a near-infinite number of possible combinations that are available to the ordinarily skilled artisan, none of which is predictable. (See, e.g., *Cox*, which evidences a large number of adjuvants, even as of 1997). See also *Ortho-McNeil v. Mylan Laboratories*, 520 F.3d 1358 (Fed. Cir. 2008). (“In sum, this clearly is not the easily traversed, small and finite number of alternatives that KSR suggested might support an inference of obviousness.”)

The Examiner has responded to this point with the apparent argument that *Cox* only describes a limited number of adjuvant combinations. While the number of possible combinations based on *Cox* may be limited--i.e., there are a finite number of adjuvants in *Cox* (albeit many of them), leading to the conclusion that there are a finite number of possible combinations--it is again noted that adjuvant behavior is unpredictable (particularly behavior pertaining to adjuvant combinations). Moreover, none of the specific combinations described in *Cox* (e.g., w/o formulations, o/w emulsions, liposome formulations) resemble the solid microparticle-based adjuvant combination presently claimed. Indeed, *Cox* expresses a clear bias against microparticles.

Thus, rather than providing “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness” as required by *KSR*, the Examiner has instead, with the benefit of undue hindsight, taken random references disclosing various elements of the claimed invention and combined them together as an obviousness rejection.

Finally, it is again noted that the Examiner has ignored the requirement that one of ordinary skill in the art must have a reasonable expectation of success. Such an expectation is unfound here, for example, due to the complex and poorly understood nature of adjuvant action.

For at least these reason, it is respectfully submitted that claims 20 and 21 are patentable over O'Hagan, Hawkins, Muttillainen and Cox.

**CONCLUSION**

Applicant submits that all pending claims are in condition for allowance, early notification of which is earnestly solicited. Should the Examiner be of the view that an interview would expedite consideration of this Amendment or of the application at large, the Examiner is requested to telephone the Applicant's attorney at (703) 433-0510 in order to resolve any outstanding issues in this case.

**FEES**

The Office is authorized to charge any fees that may be due and owing as a result of this Response to deposit account number 50-1047.

Respectfully submitted,

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